DOCUMENT RESUME

ED 229 205 RC 014 021

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TITLE Applications of Electronic Technologies to Rural Education.
INSTITUTION Manifest Learning Systems, Inc., Tiburon, CA.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE Jul 80
NOTE 18p.; Developed as part of the background material for a Workshop on Telecommunications in the Service of Rural Education (Washington, DC, July 8-9, 1980). For related documents, see RC 014 018-021.
PUB TYPE Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Educational Technology; Elementary Secondary Education; *Program Development; Rural Schools; School Size; *Site Selection; *Small Group Instruction; *Small Schools; *Technological Advancement; Telecommunications
IDENTIFIERS Isolation (Geographic)

ABSTRACT

The paper seeks to find a way to make rural education the focus of special efforts to develop electronic technologies, and to use rural schools as the developmental sites for configurations of technology that have broad and general utility. The first section suggests that smallness is an asset to rural education, for education in small units is more humane, more time is spent on-task, and violence and discipline problems diminish. Administratively, special school programs can be provided to meet the needs of special learners, some schools can emphasize basics, and others, creative skills, etc. The next section deals with the myth that persists that the education provided in rural areas is poor, and that smallness is one of the main handicaps which leads to high costs, the low quality of existing instruction, the limited range of available programs, and the inability to provide special services to special populations. Additional sections cover questions concerning electronic technologies (can electronic technologies reduce costs? can electronic technologies improve the limited range of available programs in small schools? can electronic technologies provide special services to special populations?) and a conclusion. (AH)

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APPLICATIONS OF ELECTRONIC TECHNOLOGIES TO RURAL EDUCATION

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Developed as part of the background material for a "Workshop on Telecommunications in the Service of Rural Education," 8-9 July 1980, Washington, D.C., sponsored by the National Institute of Education.

RC014021

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INTRODUCTION

The intent of this paper is to provide a framework for considering applications of electronic technologies to improving rural education. The emphasis is on "rural" in a special way which will be best illuminated by considering what this paper does not attempt to do:

1. This paper does not attempt to survey the endless possibilities of the new technologies. Given the rate at which new capabilities are being developed, and the hardware already on the shelf, this paper simply assumes that virtually anything could be developed. Whether an appropriate configuration of electronic technology is developed which can significantly improve rural education is a very different thing.

2. This paper does not merely focus on improving education through applications of electronic technology. While any technology which significantly improves education in general will have applicability to rural education, and will eventually trickle down to rural schools, this should no longer be acceptable to rural people. Such trickle-down improvements often are ill-suited to rural situations, and the whole development process continues to treat rural areas as mere extensions of urban and suburban schools.

Rather, this paper seeks to find a way to make rural education the focus of a special effort to develop electronic technologies for them, to use rural schools as the developmental sites for configurations of technology that have broad and general utility. Then the initial money and concern would flow to rural schools and communities first. While recognizing that this is a mixed blessing, that being the developmental site for something new with funding from outside, probably Federal government funding, is not something that a lot of rural people and rural communities would care for, there is nevertheless important political and symbolic reasons for such a move. And certainly enough rural communities would embrace such a developmental effort to enable it to be accomplished.

FOCUSING ON SMALLNESS

Is there such a focus? Is there a problem in rural America's education system which, if solved, would have broad and general utility, and for which rural schools are the obvious place to start? The focus with the best chance of meeting these criteria is smallness. If through appropriate electronic technology delivery of education through small units can be made educationally sound and economically viable, this would have very far-reaching consequences. And rural schools would be the logical place for demonstrating that it can be done.

To elaborate on this framework, consider first the educational advantages of smallness, given the nearly crippling nature of the forces attacking American education today. A convincing case can be made that violence and vandalism, drug use, and other aberrations disappear when education is conducted in smaller units (at the outside fewer than 400 students in building; optimally fewer than 200).

The present charge that large schools are unresponsive and unwieldy, leveled by parents, teachers, researchers, and students themselves, would be met. Smaller schools are organizationally much more capable of responsiveness, and if through electronic technology a comprehensive curriculum can be offered, this responsiveness would be made meaningful.

Smaller units are also inherently more humane, and while a large part of the present massive defection of middle class children to private schools is a response to forced busing, a large proportion do not like the atmosphere of the large factory-like schools. Smaller schools allow for more personal contact.

Simultaneously small schools can be more educationally demanding, as with the reduction in discipline problems comes an increase in time spent learning. The time-on-task variable is one of the first of the "variables that make a difference" to come out of the present shift in educational research, and smaller schools would almost immediately increase this variable significantly in the country.

There are also administrative advantages. Single-interest pressure groups could be defused by the provision of education in small units. Some of the small schools could provide sex education, others not; some could teach evolution, others creation; some could provide a disciplined basic-skills orientation, others more freedom. All of the advantages that were claimed ten years ago for alternative schools are still possible, but the alternative schools movement faltered from the inability to deliver the quality of curriculum needed. If electronic technologies can solve that problem, the advantages are still there. And administrators would love not to have to face the

hassle of closing schools as enrollment drops. They just don't know a way economically to keep buildings open with so few students (or at least they believe that they are making cost-effective decisions; a more careful analysis might suggest otherwise right now).

Other opportunities for putting rural education at the top of the policy priorities of state and Federal funding agencies are much weaker. While concern about improving rural education is increasing, the political strength of the concern does not begin to rival that of many other areas of educational interest: vocational and career education, particularly in relation to youth unemployment; improving educational opportunities for various minorities; and dealing with the crises of the system, such as violence and vandalism, school finance, and teacher unionism. By contrast the political power of rural America is unfocused, the diversity of rural America is such that areas with common problems are scattered across the states so that treating them as a class is very difficult; or mobilizing them to act as a class is almost impossible.

If raw political strength is not a way to increase concern for rural education, neither is the approach of arguing that rural schools have particularly unique problems likely to work. Unfortunately it is very difficult to argue analytically that rural problems are all that unique. While vocational education is inappropriate to the rural environment, vocational education is also massively inappropriate and ineffective throughout the country, particularly in inner-city areas; while there is inequitable distribution of funds to rural schools and among rural schools, this is perhaps even more true within any large

district; while teachers for rural areas may be inappropriately trained and the isolated and difficult conditions make tenure short, this is massively true in city schools; while many minorities are unserved or underserved in rural areas, this is more than equally true in urban areas. The "rural schools have unique problems" approach has limited utility. At best it will serve to gain for rural schools their fair share of allocated monies.

Capitalizing on smallness, however, represents a unique opportunity. Even though consolidation has been pushed very far, the bulk of rural education is provided in much smaller units than in metropolitan areas. Even if many of these schools are above the optimum size to gain the advantages listed above, they are nearer to it that city and suburban schools. Rural schools are thus a unique laboratory for the development and testing of ways of providing comprehensive and effective education through small schools. In addition modern communications technology is more free of geographic constraints than any other service delivery mechanism. The low population density of rural America makes using it as a development site for anything else substantially more expensive, it is almost a unique strength of electronic communications that it can bridge physical distances very cheaply. A demonstration of making small schools viable in rural areas where distances are vast would highlight this aspect of the capability the way nothing else would. Small schools do not need the massive nearby resources of a city to be educationally effective and efficient.

MAKING SMALL SCHOOLS MORE EFFECTIVE

Though the variety is enormous, rural schools are not particularly ineffective. For a hundred years the educated manpower for the growth of industries came from people educated in rural schools who migrated to cities. The data on rural schools collected by Conant which supposedly backed his call for comprehensive high schools actually undercut his own conclusions. Data from the NAEP do not show that rural schools are all that far behind, and the gap between them and the best schools in the nation is closing.

Yet the myth persists that the education provided in rural areas is poor, and that smallness is one of the main handicaps. This myth has four main components: high costs, the low quality of existing instruction, the limited range of available programs, and the inability to provide special services to special populations. Each of these needs greater elaboration.

High Costs

In any small school the cost per pupil of providing any particular program or service will be higher because fewer pupils are served. Whether this is in fact true in any particular school is complicated by the generally lower salaries in rural areas, but certainly if a small school tried to provide as comprehensive a program as a large school with a similar staffing model (separate specialists for each subject), the costs per pupil would be substantially higher. One of the major arguments for consolidation was an "economy of scale" argument, though the rapidly escalating costs of fuel for buses and the increased ability of teachers to collectively demand higher salaries calls this into question.

Low Quality of Existing Instruction

This component of the myth arises largely from data on the qualifications of rural teachers They tend, on the whole, to be less well trained, to have done less well in college, and often to be products of the local community. In addition there are fewer books, fewer instructional materials in general, and of course, a community with its own parochial outlook which will limit what is permitted in the schools. The isolation of the teachers makes peer contact difficult, so there are fewer sources of new ideas and materials, or new ways of teaching. It was simply not expected that children in rural schools could be exposed to the quality of instruction supposedly needed by citizens in the culture.

Limited Range of Available Programs

Given that small schools tend to model larger schools, with specialists teaching courses in their disciplines, no small school can have the staff to offer the full range of courses a large school can offer. Even though very few students will in fact take advantage of any particular course, the lack of advanced mathematics offerings, drama, music, art, or a number of vocational specialties gives the image of an inadequate program.

Special Services to Special Populations

If the range of offerings to the general student body is limited, the problems are compounded with minorities. In the case of handicapped children, the numbers with any particular disability

are so few as to make specialized instruction extremely expensive. With larger groups of minorities in rural areas: Native Americans, migrants, Spanish speaking students, or Blacks, the local political dynamics often result in severely inequitable treatment.

The Truth in the Myth

As with any myth there is a kernel of truth. Costs are higher in rural education, and the more separate small units there are, the higher the costs are likely to be to provide an equivalent education using the now standard model of schooling. As suggested in the introduction, if these costs are really weighed against the achievement levels of students and the absense of other problems of large schools, the cost-benefit tradeoff is likely not to be so biased against small schools.

For the purposes of this paper, however, the focus is different. If a way can be found, through electronic communications technology, to either reduce costs, or to provide a curriculum equivalent to that of a larger school for about the same cost, the myth would have been hit at its strongest point.

The same is true for the other three aspects of the myth. The quality of the teachers is probably somewhat less good, though since there is increasing evidence that it is the quality of the human connection, not the training of the teacher, that determines the quality of the education. There is a more limited range of offerings, though when large schools seem to graduate many students who are barely more than functionally literate, it is not clear what the

larger range of offerings really means. And minorities are severely discriminated against, though whether it is worse than in cities is a moot question.

This paper, however, takes a direct look at the applicability of electronic communications technology to addressing these four problems, on the assumption that if these four aspects of the myth can be directly confronted, the other benefits of smallness will make the package seem attractive to a broad general audience.

ELECTRONIC TECHNOLOGIES AND LEARNING

Before examining the availability of electronic solutions to these problems, a work needs to be said about what constitutes learning, and the role that electronic technologies can play in that. While this question could be a book in itself, and the rapid development of the hardware capabilities suggests that not much is truly impossible, this paper takes the position that learning has two broad phases:

1. There is the phase of taking in information. This has to do with assimilating the content of instruction through listening to presentations, reading, watching demonstrations, etc. and practicing exercises which have "right" answers: questions, tests, essays, etc. to make sure the information has been taken in.

2. There is the phase of working with the information in one's own way: talking with people about it, forming opinions based on it, trying it out in real life situations, comparing it with one's own experience and ultimately finding or creating one's own meaning out of it.

Given the present state of technology, the first phase might well be accomplished by some configuration of electronic technology, perhaps in a way substantially more effective and efficient than what teachers are able to do today. The second phase cannot be done by electronic technologies, and possibly never will be able to be. How one ultimately makes new knowledge a part of oneself is a human-interaction, life-living process, and machines are a long way from providing the full richness of human experience.

For the purposes of this paper, therefore, no expectation is present that electronic technologies will totally replace teachers. Rather, it is possible for technologies to take over much of the content presentation and accuracy of assimilation tasks that teachers presently perform. Done well this should increase the amount of time teachers can devote to planning and conducting the kinds of human interaction experiences necessary to really making any new knowledge one's own.

CAN ELECTRONIC TECHNOLOGIES REDUCE COSTS?

There are two sources of reducing costs in rural schools: to reduce the costs of transportation, and to replace some teachers. The vast bulk of a district's costs are tied up in salaries and transportation. Reducing transportation costs is certainly possible. Distance education has a long and distinguished history throughout the world, and in adult education in rural areas of the United States. Simple radio broadcasts, or amplified telephone hook-ups between the classes and remote listening posts work quite effectively. Ideally there is a remote listening location to which a group of

students go, ideally there is an interactive capability so they can ask questions of the instructor, and usually there are accompanying materials. Present technology would also permit low-frequency point-to-point television hook-ups.

These arrangements would be most appropriate in districts where the geographic distances are huge, or where local geography makes transportation very difficult for certain times of the year. While adults can manage such remote listening posts without an instructor on site, it is not clear that younger students can. Probably there would need to be an adult in attendance, so salary costs would not be reduced substantially and might even be increased.

There are literally dozens of ways such remote listening centers could be set up technologically ranging from micro-wave to satellite, telephone to cable. It is also possible to take a larger view of the information needs of rural areas, and to create these listening centers (communication centers) in schools or other buildings with multiple links to many information networks, and as a site where anyone in the immediate rural area could come to use the facilities. This, of course, would reduce the costs for the public education portion.

In terms of the original question, can education in small units be delivered effectively within the cost limitations, the answer is, "Yes," right now, and without sophisticated new equipment. Whether video-tapes or video-discs or satellite transmissions are any particular improvement over radio transmissions with supplementary materials mailed to the students remains to be seen.

CAN ELECTRONIC TECHNOLOGIES IMPROVE THE LOW QUALITY OF EXISTING INSTRUCTION?

In terms of the dramatic and effective transmission of material, it is hard to believe that any teacher anywhere could compete with a top quality television program. Programs of the order of Sesame Street, Electric Company, The Ascent of Man, and the Shakespeare plays cannot be duplicated by individual teachers. Yet even though quality programs such as these have been available on film for some years, often even with student materials and teachers' guides for instructional purposes, they have not been widely used.

The reasons are many. They range from equipment difficulties and uncertainty about delivery of films, to the time it takes to review programs such as these in preparation of a lesson, to the difficulties of going back over sections of it for instructional purposes, directing attention to different levels of the material. Use of such dramatic presentations in an interactive learning mode is substantially more difficult than merely passively watching it and learning whatever one learns.

The capabilities of microprocessors and video-discs suggest that it will soon be possible to have a video and sound presentation with interspersed questions, exercises, and decisions; recycling along several branches if the pupil makes mistakes, and even an automatic record of pupil progress. Yet what actually exists at present does not have these capabilities, and even if the hardware configurations were available, it would take some time to develop effective programs.

Short of this, video-tapes and video-discs have certain advantages over film, cable, and broadcast transmissions. The self-contained unit and the relatively cheap cost give the teacher more flexibility in use, and a wider selection of available programs. Microprocessors are already effective at drill on material involving alpha-numeric displays, and video-games are interactive and can be designed to teach certain things. However, the net gain over a textbook, or a radio or television broadcast with associated materials, or a film embedded in a curriculum segment is relatively marginal.

Developing effective software depends to a great extent on standardizing the equipment configuration for which the software will be developed. It is simply too expensive otherwise. The most critical next step is to develop prototypes of self-contained teaching configurations and test them out.

In order to have these configurations fit education in small schools, several considerations will need to be paramount. Cost will need to be kept within the instructional materials budgets of small schools (probably less than 2¢ per student hour); machine reliability will need to be very high (spare parts and service in rural areas are usually non-existent); capital cost and teacher training will need to be within the reach of small schools; and the equipment configuration will have to acceptable to rural people: it cannot demand such a radical restructuring of schooling that rural people turn their backs to it.

CAN ELECTRONIC TECHNOLOGIES IMPROVE TH
LIMITED RANGE OF AVAILABLE PROGRAMS IN
SMALL SCHOOLS?

The same issues outlined above for improving existing instructional programs apply here, except that even if a standardized equipment configuration existed which had a great many programs unavailable in typical small schools, there would be the question of the capacity of the teaching staff to plan and carry out the necessary human interaction experiences to enable the students to integrate the new learning. This demands that the software not require a specialist in each of the subject matter areas, and whether or not this happens depends on the model of schooling implicit in the way the materials are designed.

The ideal would be to have a rather different model of schooling, one which allowed a very few teachers to manage literally hundreds of students working at self-contained study centers simultaneously, on a whole variety of different programs. The remaining teachers would be generalists who planned and conducted the associated activities to each of the instructional programs but did not need to be specialists in each of the subject matter areas. Then a relatively few teachers could provide a much broader range of programs.

A lot depends on whether this model of schooling is in mind from the beginning. Then various mechanisms can be created to supplement the generalist teachers lack of specific knowledge, such as telephone links to specialists in regional centers or state agencies. If the software depends on specialists, it will be difficult to use in small schools and not serve to take advantage of smallness.

CAN ELECTRONIC TECHNOLOGIES PROVIDE SPECIAL SERVICES TO SPECIAL POPULATIONS?

Insofar as either special knowledge is required, or special arrangements are needed to compensate for the difficulties of physical travel, electronic technologies clearly can be used to provide for special populations if they are developed the way outlined in the three sections above. Indeed, culturally specific programs will probably be among the first supported by Federal funds.

Yet very little can be done to compensate for the local political circumstances through the use of electronic technology, and the local situation may very well dictate whether even the finest of programs could be implemented. Providing locally objectional programs through home study centers, or through minority run organizations that serve the minority population might well make much more sense. Again, the requirements of planning the configuration of technology so that it supports providing education through small units and does not demand a local expert become paramount.

CONCLUSION

Since both the programming and the equipment for technology-based education are expensive, there will be a tendency for the development to ignore small schools. Once a configuration is standardized that demands bigness, rural schools will again be at a disadvantage, and many of the genuine opportunities to take positive advantage of the strengths of smallness will have been lost. There will not be enough money or flexibility to allow

locally developed curricula. The rural market itself is not large enough to claim its own specially developed equipment configurations and programs. The only effective approach is to emphasize the broad and general advantages of providing education effectively and cheaply to small groups, and to make the case that rural schools are the ideal place to have in mind when designing.